

Bordeaux mixture on the leaves. The depression of the yield increased with the strength of the mixture applied. As a rule, the beneficial effect of the mixture has been ascribed to the shade-effect of the covering, which was supposed to protect the plants from too great an intensity of light. EWERT found that bean plants shaded by a light gauze during periods of greatest illumination gave a greater yield and retained their leaves longer than unshaded plants. A similar effect produced by a covering of Bordeaux mixture, he thinks, would be counterbalanced by the ill effects of the shade on cloudy days and the toxic effects of the copper. In the experiments with currants, it was found that spraying berries with Bordeaux mixture or dipping them into it increased their sugar content considerably. How this effect is brought about is not yet clear. This effect on the berries is so striking that a decrease in their sugar content, due to depression of the assimilatory activity resulting from spraying the leaves, can be easily overlooked. Two sprayings of the leaves with 4 per cent mixture resulted only in a decrease of 0.5 per cent in the sugar content of the berries which were protected from the spray. This decrease is attributed to the deleterious effects of the mixture on the assimilatory activity of the leaves.—H. HASSELBRING.

**Dispersal of seeds by ants.**—SERNANDER<sup>21</sup> organized the disjointed and inaccurate data on the importance of ants in the distribution of certain seeds and fruits, and added a wealth of observations and experimental evidence upon this phase of ecological science. This particular kind of distribution he termed "myrmecochorous," and showed that it was almost wholly due, not to the supposed mimicry of the pupa of ants by the seeds, but to the presence of certain oil bodies or "elaiosomes" which serve as food for the ants and hence cause their collection and storage. These bodies occur as various morphological modifications or appendages of seeds and fruits, various types being distinguished. Some 120 plants were at that time listed as myrmecochorous, and evidence was produced that the activity by a single colony of ants for one season includes the transportation of many thousand seeds, some to distances of 15 to 70 meters.

A recent article by MORTON<sup>22</sup> calls attention to the important foundation laid by SERNANDER, cites the contributions that have appeared since that date, and summarizes the present situation of myrmecochory. The number of myrmecochorous plants has been considerably increased, although these studies have been almost exclusively confined to Europe. The associations affected are mostly those of woodland and ruderal plants. MORTON concludes that ants have been acting as a selection factor for such plants at least since

<sup>21</sup> SERNANDER, R., Entwurf einer Monographie der europäischen Myrmekochoren. Kungl. Vetensk. Akad. Upsala 41: 1906.

<sup>22</sup> MORTON, FRIEDRICH, Die Bedeutung der Ameisen für die Verbreitung der Pflanzensamen. Mitt. Naturwiss. Vereins 1912:77-112. Reprint by author, 1913.



the Tertiary age, and that the center of distribution of woodland forms has been the forests of central Europe, while ruderal myrmecochorous forms have radiated from the Mediterranean region. The elaiosomes, in his opinion, have originated in many ways quite independently of the purpose they now serve as factors in distribution.—GEO. D. FULLER.

**Anisophylly.**—In *Strobilanthes anisophyllus* FIGDOR,<sup>23</sup> experimenting to discover the cause of the development of isophyllous shoots, is satisfied that it is a reversion to juvenile form because seedlings show no anisophylly until they have attained considerable size, and he thinks that it should be possible to prolong isophyllous development indefinitely. He agrees with BOSHART<sup>24</sup> that good nutrition tends to promote isophylly, but takes exception to his statement that anisophylly is to be explained through dorsiventrality. BOSHART<sup>25</sup> in a more recent paper lays emphasis on his former points, such as the asymmetry of the growing point of anisophyllous shoots and the very slight effect of gravity and light. He thinks that the latter factor may affect anisophylly through increasing or decreasing the vigor of the shoot, the weakening favoring asymmetry. He finds, on the contrary, light exercising a direct influence upon the anisophylly of certain species of *Selaginella* and *Lycopodium*.

Anisophyllous rosettes in various species of *Sempervivum* have been experimentally shown by DOPOSCHEG-UHLÁR<sup>26</sup> to result from an inclination of the stem axis toward the horizontal, but whether the response was effected by gravity or light he was unable to determine. The anisophylly seems to disappear toward the close of the growing season and to be renewed early the following spring. The phenomenon in nature is closely associated with the crowded grouping of young plants about the parent rosette in the characteristic multiplication by offshoots.—GEO. D. FULLER.

**Morphology of Agathis.**—EAMES<sup>27</sup> has investigated the Kauri, the famous timber tree of the Australasian region. Our knowledge of the morphology of the araucarians has lagged behind that of the other coniferous tribes, so that this contribution is very timely. An outline of the results is as follows. Pollination occurs a year after the appearance of the ovulate strobili, and fertiliza-

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<sup>23</sup> FIGDOR, W., Das Anisophyllie-Phaenomen bei Vertretern des Genus *Strobilanthes* Blume. Ber. Deutsch. Bot. Gesells. 29:549-558. 1911.

<sup>24</sup> BOSHART, K., Beiträge zur Kenntnis der Blattasymmetrie und Exotrophie. Flora 103:91-124. 1911.

<sup>25</sup> BOSHART, K., Über die Frage der Anisophyllie. Ber. Deutsch. Bot. Gesells. 30:27-33. 1912.

<sup>26</sup> DOPOSCHEG-UHLÁR, J., Die Anisophyllie bei *Sempervivum*. Flora 105:162-183. 1913.

<sup>27</sup> EAMES, ARTHUR J., The morphology of *Agathis australis*. Ann. Botany 27:1-38. figs. 92. pls. 1-4. 1913.